

MATERIAL SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2320
Gaithersburg, Maryland 20899-2320

SRM Number: 2639a
MSDS Number: 2639a
SRM Name: Carbon Monoxide in Nitrogen

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Description: This SRM is a mixture of carbon monoxide in nitrogen provided as a compressed gas in a DOT 3AL specification aluminum (6061 alloy) cylinder equipped with a CGA-350 brass valve at a nominal pressure of 12.4 MPa (1800 psi). This cylinder with a water volume of 6 L provides the user with 0.73 m³ of useable mixture. NIST recommends that this cylinder **NOT** be used below 0.7 MPa (100 psi).

Substance: Carbon Monoxide/Nitrogen Compressed Gas Mixture.

Other Designations: Carbon Monoxide (carbon oxide)/Nitrogen (dinitrogen) compressed gas mixture.

2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Component	CAS Registry	EC Number (EINECS)	Concentration
Carbon Monoxide	630-08-0	211-128-3	1 % mol/mol *
Nitrogen	7727-37-9	231-783-9	balance

* Concentration applies to the identified NIST cylinder.

Index, R/S Phrases (EU): Refer to Section 15 "Regulatory Information".

3. HAZARDS IDENTIFICATION

NFPA Ratings (Scale 0–4): Health = 3 Fire = 0 Reactivity = 0

Major Health Hazards: Difficulty in breathing, blood damage, suffocation.

Physical Hazards: Cylinder may rupture or explode if exposed to heat.

Potential Health Effects (Short Term Exposure)

Inhalation: Changes in body temperature, changes in blood pressure, nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, disorientation, hallucinations, pain in extremities, tremors, loss of coordination, hearing loss, visual disturbances, eye damage, suffocation, blood disorders, convulsions, coma.

Skin Contact: No information on significant adverse effects.

Eye Contact: Irritation, blurred vision.

Ingestion: Ingestion of a gas is unlikely.

Listed as a Carcinogen/Potential Carcinogen

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	<input type="checkbox"/>	<input checked="" type="checkbox"/>
In the International Agency for Research on Cancer (IARC) Monographs	<input type="checkbox"/>	<input checked="" type="checkbox"/>
By the Occupational Safety and Health Administration (OSHA)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

4. FIRST AID MEASURES

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration by qualified personnel. Get immediate medical attention. **Note to Physician:** For inhalation, consider oxygen.

Skin Contact: Wash affected skin with soap and water for at least 15 minutes while removing contaminated clothing. Get medical attention, if needed.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Get immediate medical attention.

Ingestion: Ingestion of gas is unlikely.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Negligible fire hazard applicable to the identified NIST cylinder. Cylinder may rupture or explode if exposed to heat. Escaping gas mixture promotes combustion of surrounding materials.

Extinguishing Media: Regular dry chemical, carbon dioxide.

Fire Fighting: Move cylinder from fire area if it can be done without risk. Avoid inhalation of material or combustion by-products. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

Flash Point (°C): Not Applicable **Autoignition (°C):** Not Applicable **Method:** Not Applicable

Flammability Limits in Air (Volume %): Upper: Not Applicable

Lower: Not Applicable

Flammability Class (OSHA): Not applicable to the identified cylinder.

6. ACCIDENTAL RELEASE MEASURES

Occupational Release: Stop leak if possible without personal risk. Isolate hazard area and deny entry. Stay upwind and keep out of low areas. Refer to Section 13, “Disposal Considerations”.

7. HANDLING AND STORAGE

Storage: Store and handle in accordance with all current regulations and standards. Secure cylinder to prevent physical damage. Keep valve protective cap on cylinder when not in use. Keep separated from incompatible substances. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101.

Safe Handling Precautions: Wear safety goggles. See Section 8, “Exposure Controls and Personal Protection”.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Nitrogen Gas

ACGIH (inhalation): simple asphyxiant

UK OES (inhalation): simple asphyxiant

Carbon Monoxide

OSHA TWA (inhalation): 55 mg/m³ (50 ppm)

ACGIH TWA (inhalation): 27 mg/m³ (25 ppm)

UK OES TWA (inhalation): 35 mg/m³ (30 ppm)

Ventilation: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Respirator: If necessary, refer to the “NIOSH Guide to the Selection and Use of Particulate Respirators Certified under 42 CFR 84” for selection and use of respirators with organic vapor cartridges certified by NIOSH.

Eye Protection: Wear safety goggles. **DO NOT** wear contact lenses in the laboratory. An eye wash station should be readily available near of handling and use areas.

Personal Protection: Wear protective clothing and chemically resistant gloves to prevent skin exposure.

9. PHYSICAL AND CHEMICAL PROPERTIES

Nitrogen Gas	Carbon Monoxide Gas
Appearance and Odor: colorless and odorless	Appearance, Odor, Taste: colorless, odorless, tasteless
Molecular Weight: 28.01	Molecular Weight: 28.01
Molecular Formula: N ₂	Molecular Formula: CO
Boiling Point (°C): -196	Boiling Point (°C): -192
Freezing Point (°C): -210	Freezing Point (°C): -199
Vapor Density (air = 1): 0.97	Vapor Density (air = 1): 0.97
Volatility (%): 100	Volatility (%): not applicable
Solubility in Water: slightly soluble	Solubility in Water (%): 2.3 @ 20 °C
Solvent Solubility: soluble in liquid ammonia; slightly soluble in alcohol	Solvent Solubility: soluble in alcohol; benzene; acetic acid; ethyl acetate; chloroform; cuprous chloride solutions

10. STABILITY AND REACTIVITY

Stability: X Stable Unstable

Stable at normal temperatures and pressure.

Conditions to Avoid: Avoid heat, flames, sparks and other sources of ignition. Minimize contact with material. Avoid inhalation of material or combustion by-products. Protect from physical damage. Cylinder may rupture or explode if exposed to heat.

Incompatibilities: Metals, oxidizing materials, halogens, metal oxides, metals, combustible materials, lithium.

Fire/Explosion Information: Refer to Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Thermal decomposition or combustion produces oxides of nitrogen and carbon.

Hazardous Polymerization: Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Entry: X Inhalation Skin Ingestion

Nitrogen Gas

Compressed nitrogen gas is a simple asphyxiant.

Carbon Monoxide

LC_{Lo} (inhalation-human): 4 mg/m³/12 hour(s)

TC_{Lo} (inhalation-human): 6 mg/m³/25 min

TC_{Lo} (inhalation-human): 220 mg/m³/3 h

TC_{Lo} (inhalation-human): 600 mg/m³/10 min

TC_{Lo} (inhalation-human): 800 mg/m³/5 min

Health Effects (Acute Exposure):

Carbon monoxide is not detectable by odor and headache should be taken as a warning that a dangerous concentration is being inhaled. In sudden exposures to high concentrations, weakness and dizziness may be the only symptoms preceding collapse. Symptoms may include increasingly severe headache, dyspnea on exertion, decreased manual dexterity, impaired judgment and memory, irritability, emotional instability, dizziness, fatigue, drowsiness, confusion, nausea, vomiting, palpitations, and impaired vision and hearing. With continuing exposure, there is a progressive worsening of all symptoms. In pregnant women, carbon monoxide readily crosses the placental barrier. Acute non-lethal intoxication may result in miscarriage or permanent neurological sequelae such, as cerebral palsy, in the newborn.

The symptoms of asphyxia depend on the rapidity with which the oxygen deficiency develops and how long it continues. In sudden acute asphyxia, unconsciousness may be immediate. With slow development, there may be rapid respiration and pulse, air hunger, dizziness, reduced awareness, tightness in the head, tingling sensations, incoordination, faulty judgment, emotional instability, and rapid fatigue. As the asphyxia progresses, nausea, vomiting, collapse, unconsciousness, convulsions, deep coma and death are possible.

Medical Conditions Generally Aggravated by Exposure: Blood system disorders, heart or cardiovascular disorders, hormonal disorders, respiratory disorders.

12. ECOLOGICAL INFORMATION

Environmental Summary:

Nitrogen: No data available.

Carbon Monoxide LC₁₀₀ (fish): 75 mg/L/1 d.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: The cylinder is the property of the purchaser. Dispose in accordance with all applicable federal, state, and local regulations. Carbon monoxide is subject to disposal regulations: U.S. EPA 40 CFR 262, Hazardous Waste Number(s): D001.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: Compressed Gas, N.O.S. (Carbon Monoxide in Nitrogen); UN1956; Hazard Class 2.2.

Canadian WHMIS: Compressed Gas, N.O.S. (Carbon Monoxide in Nitrogen); UN1956; Hazard Class 2.2.

15. REGULATORY INFORMATION

U.S. REGULATIONS

CERCLA Sections 102a/103 (40 CFR 302.4): Not regulated.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Not regulated.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21)

ACUTE: Yes

CHRONIC: No

FIRE: No

REACTIVE: No

SUDDEN RELEASE: Yes

STATE REGULATIONS

California Proposition 65: Carbon monoxide is known to cause developmental toxicity (01 July 1989).

CANADIAN REGULATIONS

WHMIS Classification: Not determined.

EUROPEAN REGULATIONS

EU Classification

Nitrogen: Not determined.

Carbon Monoxide:

F⁺ Extremely Flammable.

T Reproductive Toxin Category 1.

EU Risk and Safety Phrases

Nitrogen: Not determined.

Carbon Monoxide:

R12 Extremely flammable.

R23 Toxic by inhalation.

R48/23 Toxic: danger of serious damage to health by prolonged exposure through inhalation.

R61 May cause harm to unborn child.

S45 In case of accident or if you feel unwell, seek medical advice immediately (show label where possible)

S53 Avoid exposure - obtain special instructions before use.

NATIONAL INVENTORY STATUS

U.S. Inventory (TSCA): Listed on inventory.

TSCA 12(b), Export Notification: Not listed.

16. OTHER INFORMATION

Sources: MDL Information Systems, Inc., MSDS *Nitrogen*, 17 June 2004.

MDL Information Systems, Inc., MSDS *Carbon Monoxide*, 09 December 2004.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use as a guide in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data in the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.